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# MERCURIC CHLORIDE AS AN INSECTICIDE.

By G. M. GUITERAS, Surgeon, United States Public Health and Marine-Hospital Service.

The idea of using corrosive sublimate as an insecticide was obtained from G. F. Matzke, steward on the American schooner *Beecham*, who stated to the writer that he had used it in the cabin of his vessel with success.

A partial study (partial on account of the limited facilities at command) of the literature on the subject appears to show that the use of mercuric chloride in this connection has not heretofore been mentioned. A few experiments were therefore undertaken, especially with the object of demonstrating the usefulness of the agent as a mosquitocide.

The experiments were conducted in a room 12 feet high by 15 feet by 13¼ feet, having a capacity of 2,385 cubic feet. Two large windows and one door opened into the room. The room, which is used as a laboratory, contained a gas stove, 2 cupboards, a couch, tables, and chairs.

The results were as follows:

*First experiment.*—In the apartment mentioned, on September 14, 1909, 60 grams of mercuric chloride were sublimed in a porcelain evaporating dish, the room being sealed and kept closed for 2 hours. A mosquito cage with a capacity of 1 cubic foot, covered with wire gauze and containing about 20 mosquitoes, was exposed close to the ceiling of the room. All mosquitoes found dead. Fly in a powder box, killed. Bed bugs in a powder box, 50 per cent dead; others stunned. Croton bugs in powder box, a few dead; majority alive, but not active. Croton bugs in powder box between 2 layers of blanket, all alive, but activity lessened. With the exception of the mosquito cage, which, as stated, was placed near the ceiling, the insects were distributed about the room, on tables, and on the floor. Temperature of room about 86° F.

*Second experiment.*—September 15, 1909. Thirty grams of mercuric chloride, 3 hours' exposure. Mosquitoes in cage near ceiling, all killed. Roaches and bedbugs unharmed. Temperature about 85° F.

In the remaining experiments 3 mosquito cages were used, 2 of them being 12 inches square by 5 inches in height and one 8 inches square by 4 inches in height. They were all covered with wire gauze.

*Third experiment.*—October 2, 1909. Sixty grams mercuric chloride, 3 hours' exposure. One mosquito cage under couch against wall with blanket covering reaching to within 3 inches of floor. Two dead, 2 alive and fairly active. One mosquito cage inside of cupboard, cage covered with toweling; cupboard door left ajar about 4 inches. Four dead; 1 alive, but incapable of flight. One mosquito cage on top of cupboard, about 8 feet from floor; cage covered with toweling. Eight insects, all dead. Temperature of room, 77° F.

*Fourth experiment.*—October 3, 1909. Conditions the same as in experiment No. 3, except that the temperature of the room at the beginning of the experiment was 80° and at the close 88° F.

Cage No. 1. Seven insects. Cage No. 2. Nine insects. Cage No. 3. Six insects. All mosquitoes apparently dead. On examination of the cages 24 hours after fumigation one mosquito was found with slight movement of the legs, but otherwise unable to move. Some hours afterwards it was dead.

*Fifth experiment.*—October 15, 1909. Cage No. 1. Ten insects. Cage No. 2. Twelve insects. Cage No. 3. Eight insects. Temperature at beginning, 80° and at close 84° F. Sixty grams of mercuric chloride used, time of experiment 3 hours. Bedbugs under one layer of blanket, alive. Bedbugs under 2 layers of blanket, alive. Roaches under one layer of blanket, alive. Bedbugs under 4 layers of huckaback toweling, 1 dead, 2 alive. Bedbugs under 4 layers of crash toweling, 1 dead, 2 alive. Bedbugs exposed in powder boxes, alive. Roaches in powder boxes, alive. Grasshopper, alive. Flies exposed in powder boxes, dead. Mosquito cage No. 1. Under couch covered to 3 inches from floor, 9 dead; 1 alive, slight motion only. Cage No. 2. On top of safe, covered with towels, all dead. Cage No. 3. In closet, cage covered with towels, 6 dead; 2 alive, slight motion only. The live mosquitoes were kept under observation and none of them retained sufficient vitality to fly.

About 20 minutes are consumed in subliming 60 grams of mercuric chloride. Brass work is not tarnished. Nickel-plated ware and instruments are untarnished if wiped off immediately after fumigation. Painted surfaces are unaffected unless the mercuric chloride is sublimed close thereto and not wiped off immediately. Does not affect colored silk, cotton or woolen goods.

It is evident that temperature plays an important part in the efficiency of mercuric chloride as a mosquitocide, as shown by experiment 3, where the temperature was 77° F. And this is only to be expected, for a low temperature will tend to deposit the mercuric chloride more quickly, and thus prevent its rapid circulation. It is effective, however, at temperatures above 80° F., and in the vast majority of cases in yellow fever work we would not have to contend with a temperature lower than this.

From these experiments it would appear that there is a field of usefulness for sublimed mercuric chloride as a mosquitocide. It seems to be effective for mosquitoes and flies.

In the experiments herein recorded, while some mosquitoes, under considerable protection, were not killed outright, still they never recovered completely from the intoxication, except in experiment No. 3, where the temperature was only 77° F. Further experiments are, however, necessary to determine this positively.

The advantages of this agent are as follows: (1) Facility of obtaining mercuric chloride. (2) Small quantity necessary. (3) Simplicity. All that is required is a good alcohol lamp and a porcelain evaporating dish. The alcohol lamp may be so gauged as to burn only for the time required for the sublimation of the mercuric chloride. This certainly is more convenient than carrying about heavy iron pots and barrels of sulphur. (4) No unfavorable action on bright metal surfaces if wiped off within a few hours; no untoward action on dress goods; no disagreeable odor remains. (5) The cost of this process is about the same as or, indeed, cheaper than sulphur disinfection.

In these experiments 25 grams were used to the 1,000 cubic feet. At the market price of mercuric chloride—that is, $1 per pound—the amount of mercuric chloride required per 1,000 cubic feet—that is, 25 grams—will cost 0.04725 cents.

For destruction of mosquitoes by sulphur, 2 pounds of sulphur are usually used per 1,000 cubic feet. The market price of sulphur at 3 cents per pound would make the cost 6 cents per 1,000 cubic feet. In addition, in practical work on a large scale the expense and trouble of hauling the disinfecting equipment from one place to another would be much diminished.

A very natural objection may occur to many to the use of this agent in the manner herein described, on account of the distribution of such quantities of so active a poison as mercuric chloride. But I think the danger more apparent than real. When the room was opened in the above experiments it was filled with a thick mist of the sublimed mercuric chloride. The room was entered without any special precaution and the windows were opened. In a few minutes the sublimed mercuric chloride was carried away by the slight air currents prevailing, leaving a slight deposit on surfaces within the room. This was allowed to remain for 2 or 3 days, the room being used in the meantime without any untoward results. The deposit, however, can be readily removed with a damp cloth, and this should be done. With very ordinary care I can see no danger in the use of mercuric chloride in the manner above described.

In conclusion, I believe that while mercuric chloride can not altogether take the place of sulphur as an insectitude it has a sphere of usefulness hitherto unrecognized, especially with reference to flies and mosquitoes.

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## ON THE RELATION OF ROCKY MOUNTAIN SPOTTED FEVER TO THE TYPHUS FEVER OF MEXICO.—A PRELIMINARY NOTE.

By John F. Anderson, Director Hygienic Laboratory, and Joseph Goldberger, Passed Assistant Surgeon, United States Public Health and Marine-Hospital Service.

Several observers and writers have called attention to the close clinical resemblance of Rocky Mountain spotted fever to typhus. One of us having seen typhus fever in England, and later the spotted fever in Montana, was also struck by the clinical similarity of the two diseases.

Typhus fever being one of the quarantinable diseases under the regulations of the Treasury Department, it seemed desirable both on theoretical and practical grounds to take up the study of typhus fever in Mexico in order to determine whether the two diseases are really identical, particularly as the work of Ricketts had developed a basis for the identification of the Rocky Mountain disease. Ricketts has shown that Rocky Mountain spotted fever has a definite clinical course in certain animals, particularly guinea pigs and monkeys, in which it also produces characteristic anatomical lesions. He has shown that in the guinea pig, after intraperitoneal inoculation of blood of spotted fever, there appears in from 2 to 5 days a distinct rise in the temperature of the animal. The fever continues to rise for 2 or 3 days, after which it maintains itself at about the level which it has attained for 2 or 3 days longer. At the end of this time the animal either dies or the fever begins to subside. The objective signs of the infection are a roseolar eruption, with hemorrhage into and frequently gangrene of the external genitals. At necropsy the most striking features are a greatly enlarged spleen and swollen and hemorrhagic lymph nodes.